E N E R M O D A L
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SUSTAINABLE BUILDING DESIGN
BUILDING & ENERGY TECHNOLOGY ASSESSMENT
ENERGY ANALYSIS SOFTWARE
WINDOW / WALL / DOOR EVALUATION

March 17, 2003

Christopher Barry
Pilkington Glass
1701 East Broadway
Toledo, Ohio
43605

Dear Chris:

Re: Energy Star and possible elimination of hard coat low-e glass

DOE has proposed a new map and criteria for Energy Star that may cause the market for hard coat low-e products to shrink to the point that it may no longer be feasible to supply the small quantity. This is a report on our study of the potential effect on Canadian Energy Consumption and Greenhouse Gas emissions.

We have used our report to Natural Resources Canada (NRCan) dated January 2003 titled "Equivalency of U-value and Energy Rating for Setting Energy Star Window Levels" to calculate the average difference between the hard coat and soft coat products. In that work RESFEN from LBNL was used to calculate the energy consumption and costs of four windows with pyrolitic and sputter coated glass. That report shows an average energy consumption difference of 1115 kWh/house/yr, or $32.20/house/yr in Canadian residences. The pyrolitic coated glass showed less energy consumption than the sputter coated glass.

The greenhouse gas emissions were calculated using the rate produced by RETScreen, which is software produced by NRCan. RETScreen shows .284t/MWh (284 kg/MWh) for electricity produced with a mix of generation sources. The mixture was calculated from Statistics Canada's report "Electric Power Statistics", July 2002. The total for 2001 was used as the basis and shows the following mix: hydro 57.4%, oil 12.9%, coal 13.0%, nuclear 13.9%, natural gas 2.8%. The GHG emissions rate for natural gas was .254t/MWh.

The market statistics were supplied by yourself and are as follows for 2001, from the Ducker Research Inc. study of the window market: Total Units were 5.2 million, total area was 89.2 million square feet, approximately 50% of the market was low-e, 50% of the low-e was pyrolitic coated and 50% was sputter coated glass. This suggests that the average window was 17.15 square feet. Since we used 300 sq. ft. per house in the NRCan study this equates to 17.5 windows per house, and a total market of 297,143 houses at that rate.

The following table shows the increase in total energy consumption and GHG emissions if there would be no hard coat low-e glass in Canada. The table shows the difference at the current market level of 50% of windows using low-e and the potential difference once the

entire market is using low-e glass. The 10-year total loss of energy and the 10-year additional GHG emissions is also shown.

Table 1: Additional Consumption if all Pyrolitic Low-e is Converted to Sputter Coat Low-e

Item	At Current Low-e Market Level of 50%	At Potential Low-e Market Level of 100%	10 Year Accumulation at Current Market	10 Year Accumulation at Potential Market
$ Fuel cost for Canada/year	$2,392,001.	$4,784,002	$131,560,063	$263,120,127
KWh consumption for Canada/year	82,828,611	165,657,223	4,555,573,619	9,111,147,238
GHG emissions (metric tonnes) for Canada/year	20,800	41,600	1,144,001	2,288,001

We therefore conclude that high solar gain low-e products (i.e. pyrolitic coatings) save energy and fuel costs, and reduce greenhouse gas emissions in northern climates.

The current proposal for the Energy Star program in the US has a three and a four-zone option. This study supports the conclusion that the four-zone option is the preferred option as it will maintain the availability and use of high solar gain low-e (pyrolitic) products, thereby reducing energy consumption and less greenhouse gas emmissions.

Yours truly,

ENERMODAL ENGINEERING, INC.

per Morgan Hanam, P, Eng.